A F 83

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

IN RE THE APPLICATION OF	)	
Brueckheimer et al.	)	EXAMINER: Thai D. Hoang
SERIAL NO.: 09/509,089	)	Group Art Unit: 2667
FILED: June 22, 2000	)	Customer Number: 23644
FOR: TRANSPORTING MULTIPROTOCOL DATAGRAMS	)	Docket No. 920476-904787
	)	

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to Commissioner for Patents, United States Patent and Trademark Office, PO Box 1450, Alexandria VA 22313-1450, Mail Stop Appeal Brief-Patents on August 23 , 2004.

Name of person signing: Kathy Kurek
Signature Kathy Kurek

BRIEF ON APPEAL

This appeal is from the Examiner's final rejection dated March 31, 2004. A timely notice of appeal was submitted on June 30, 2004 with the required appeal fee of $330.00

This Brief is being submitted in triplicate along with the required fee of $330.00 pursuant to 37 C.F.R. §1.17(c).

(1) **Real Party in Interest**

This application is assigned to Nortel Networks Limited, who is the real party in interest. The assignment is recorded at Reel 010915, Frame 0936.

(2) **Related Appeals and Interferences**

There are no related appeals or interferences.

(3) Status of Claims

This application was filed with claims 1 through 11 all of which were cancelled and replaced by new claims 12 to 99. Of the new claims, claims 35, 67, 82 & 95 have been amended once to attend to a 35 U.S.C. §112 indefiniteness rejection. Otherwise, claims 12 to 99 are pending as previously presented. Consequently, it is the rejection of claims 12 to 99 that is being appealed. The claims as currently pending are set forth in the Appendix.

(4) Status of Amendments

A paper entitled "Response to Office Action Mailed March 31, 2004" was filed June 1, 2004. The amendment of this response was to claims 35, 67, 82 & 96 in response to a 35 U.S.C. §112 indefiniteness rejection.

By an Advisory Action mailed June 23, 2004, the Examiner entered the Response and has maintained his rejection of claims 12 to 16, 20 to 37, 39 to 48, 52 to 69, 71 to 75, 78 to 82, 84 to 88, 91 to 95 & 97 to 99. It is the continued rejection of these claims that is being appealed.

(5) Summary of the Invention

The present invention is directed to a method and apparatus for transporting multi-protocol datagrams over a point to point protocol (PPP) link in an asynchronous transport network by encapsulating the datagrams into asynchronous transport network mini-cells. In the method of the invention, a channel identifier (CID) field in a header of a mini-cell is utilized to identify, through association with a respective PPP identifier (PID), the multi-protocol datagram that is encapsulated in the mini-cell.

Consequently, the present invention enables PPP datagrams to be encapsulated in AAL2 mini-cells rather than PPP's native High Level Data Link Control (HDLC)

protocol for modem transport, so that PPP can be transported over ATM and, in particular, AAL2 access links.

(6) **Issues**

The following issues are presented:

1. The rejection of claims 12 to 16, 20 to 37, 39, 41 to 48, 52 to 69, 71 to 75, 78 to 82, 84, 86 to 88, 91 to 95, 97 & 99 under 35 U.S.C. §103(a) as being un-patentable over Lyons et al (US 6075798) in view of Nagami et al (US 5,822,319); and

2. The rejection of claims 40, 85, & 98 under 35 U.S.C. §103(a) as being un-patentable over Lyons et al (US 6,075,798) in view of Nagami et al (US 5,822,319) and further in view of Lin et al (US 5742599).

(7) **Grouping of Claims**

Claims 12 to 99 can be considered as a group.

(8) **Argument**

Referring to issue 1, the Examiner has accepted that Lyons does not teach the system of the invention of encapsulating multi-protocol datagrams in mini-cells and associating Point to Point Protocol identifiers (PIDs) of the datagrams within the CID fields of the mini-cells. In fact, although not expressly stated in Lyons, it is implicit therefrom that the CID field of the mini-cells' headers is used entirely for its properly defined function of identifying AAL channels for mini-cell transport in ATM packets across an ATM network. Consequently, there is no motivation for a skilled person to contemplate modifying the system taught by Lyons by using the CID field in the manner of the first embodiment proposed by the present invention. It should also be noted that Lyons does not teach the feature of the invention of transporting asynchronous transport packets into which the mini-cells encapsulating multi-protocol datagrams as aforesaid have been assembled over a <u>Point to Point Protocol</u> link through the asynchronous

transport network. Lyons is entirely silent as to its use with the PPP. This will be discussed more fully below.

Nagami also does not teach the feature of transporting asynchronous transport packets into which the mini-cells encapsulating multi-protocol datagrams in accordance with the invention have been assembled over a Point to Point Protocol link through the asynchronous transport network. Nor does Nagami teach the system of further embodiments of the invention of encapsulating multi-protocol datagrams within mini-cells and associating Point to Point Protocol identifiers (PIDs) of the datagrams with the CID fields of the mini-cells. In fact, Nagami comprises a router cut-through technique wherein, once datagram classification has been done once, the result can be stored against short-form information such as connection identifiers in routers without further recourse to examining the content of the datagrams. As such, the whole thrust of Nagami is to avoid referring to the content of a datagram including header information during datagram transport (cf column 1, lines 57 to 67 and column 2, lines 37 to 40)). Instead, Nagami proposes using a table stored in a router which registers a correspondence between a virtual connection identifier and protocol type information as a means of identifying a transfer target network interface for a datagram without needing to access the content of the datagram. Consequently, in Nagami, the virtual connection identifier and protocol type information stored in the router table comprises knowledge local to the router in contrast with the present invention in which the connections are established end to end a priori by the ANP (Q2630.1) signalling protocol. Thus, Nagami makes no reference to associating a PPP identifier (PID) with the CID field of a mini-cell in an asynchronous transport network and is silent as to its use with the PPP.

In view of the above, it is impossible to see how it can be concluded that the combined teachings of Lyons and Nagami teach or suggest all of the claims limitations of the independent claims currently pending in the present application notwithstanding the lack of any motivation to do so nor the fact that to use the CID field in Lyons in the manner proposed by the present invention cannot possibly succeed and so offers no reasonable expectation of success. The motivation suggested at the bottom of page 3 of the office action mailed March 31, 2004 is so broad as to be meaningless in the context of a rejection under 35 U.S.C. §103(a). It is always desirable to improve technology for economic reasons but that is not sufficiently succinct as to motivate one

skilled in that art to specifically consider modifying Lyons or combining the teachings of Lyons and Nagami. In any event, as already discussed, such a combination fails to teach all of the claim limitations and would not in any event provide a workable system.

In the Advisory Action mailed June 23, 2004, the Examiner has justified his continued rejection of claims 12 to 16, 20 to 37, 39, 41 to 48, 52 to 69, 71 to 75, 78 to 82, 84, 86 to 88, 91 to 95, 97 & 99 on the premise that Lyons, although not explicitly using the statement (term) "point-to-point" is, however, based on the structure and operation of the reference (point-to-point) system such that one of ordinary skill in the art would conclude that the system is a kind system that applies the Point-to-Point Protocol. This premise is incorrect for a number of reasons as will now be explained.

First and foremost the Examiner must acknowledge the fact that the Point to Point Protocol (PPP) is specifically the "Point to Point Protocol" (RFC1661 defined by the IETF) and has specific syntax and semantics. It is not a common or garden point-to-point link as implied by the Examiner's grounds for rejecting the above identified claims. To quote from that RFC:

"*The Point-to-Point Protocol (PPP) provides a standard method for transporting multi-protocol datagrams over point-to-point links. PPP is comprised of three main components:*

1. A method for encapsulating multi-protocol datagrams.

2. A Link Control Protocol (LCP) for establishing, configuring, and testing the data-link connections.

3. A family of Network Control Protocols (NCPs) for establishing and configuring different network-layer protocols. "

PPP also has a particular frame structure which is based on HDLC (ISO 3309-1979), as modified by ISO 3309:1984/PDAD1 "Addendum 1: Start/Stop Transmission.) The Link Control Protocol is responsible for the establishment, user authentication, link configuration and IP address allocation. It may also optionally test the link quality. The

Network Control Protocol, which may be opened and closed at any time, is used to determine whether to use TCP/IP, Appletalk, IPX or any other network protocol. There can be more than one network protocol running simultaneously across the link configured by the LCP.

To better understand why the Examiner's understanding of what Lyons contributes to the art is incorrect, first consider what Lyons does not disclose and then consider what Lyons does, in fact, disclose.

What Lyons "does not disclose" is how to map the Point-to-Point Protocol (PPP) RFC1661 to AAL-2. Lyons does not state how HDLC is terminated (and not even merely encapsulated), which fields of the PPP formatted HDLC frame are significant, how those fields should map into fields of the AAL-2 connection, the relationship of LCP to the AAL2 Negotiation Procedures Q2630.1, how AAL-2 CIDs should be mapped to the LCP, how AAL-2 CIDs should be mapped to the NCP, how the 2 octet protocol field of PPP could be carried in AAL-2, how a compressed PPP protocol field could be carried in the CID field, how an uncompressed PPP protocol field could be mapped across the AAL-2 CID and PDU, how the length field of AAL-2 should be encoded to carry a PPP frame, how segmentation and reassembly should and could work, how similar network protocols could all be mapped to one AAL-2 CID even where they may be from more than one PPP LCP session.

Lyons' focus is voice communications, and in particular the dynamic change of voice compression coding during a single call on a given AAL-2 CID. It is not at all obvious given Lyons' repeated statements regarding voice applications that data communications are envisaged by his method. It is also not obvious how Lyons teachings could be extended or reused to convey PPP in any way. The only "novel" aspect in Lyons is the use of an extension header, but the format and purpose are only related to voice communication. The association of this extension header to UUI (RES) codepoints does not include codepoints used for data communication, and the explicit statement regarding the later-determined *data* codepoints in Lyons' figure 8 is: "reserved for future use". Therefore no use or intimation of use is stated absolutely, and the use of that extension header for a data application with all its voice controls is neither obvious nor likely to be worthwhile. Significantly, the present invention does not use an

extension header, and more pointedly the present invention does not use a priori defined, table-driven interpretation of UUI in conjunction with the first bit of the first octet of the payload of an AAL-2 minichannel.

In the present invention, the UUI field is used in its standard way (and not in Lyons' way) to signify the start, middle or end of a long and fragmented packet, and carries no further meaning or assistance to interpreting and processing PPP.

What Lyons does disclose is the use of the UUI field change of codepoint to signify the ephemeral use of a one octet extension to the header. That extension header is broken down into a single bit to signify, in conjunction with the particular UUI codepoint (fig 8), the voice compression coding change, the continuation of the sequence numbering (not explained but part of the UUI codepoints 0-15 in the AAL2 standard) and error detection means. It is not fully explained but a transition from any codepoint 0-15 to one of 16-19 for a short period (timed or acknowledge receipt) means that the payload of the minicell carries the extra octet of the extension header. It is also not fully explained but after receipt of the extension header, the codepoint must revert to the proper codepoint 0-15 that would be seamlessly the next in sequence (including the ones which carried any one of the codepoints 16-19), before any further change can be made. The change in voice codec remains until call termination or further transition between the two sets of codepoints.

This is not how the AAL-2 standard works in signifying changes within profiles, nor how sequence numbering works. Lyons proposal suffers several disadvantages over the standardized method, which means that the disclosure would not be referred to and is unlikely to be employed by a skilled addressee for any application because of incompatibility.

Lyons discloses already known use of the AAL-2 CID to signify the Logical Link Connection (LLC) ID for a given user, but no further significance is attached to this or its use outside of voice communications. Lyons discloses already known end-to-end negotiation to assign a CID, but again no further significance is attached to this except to establish or terminate an end-to-end user voice call.

Applicant therefore fails to see how Lyons could inspire any further application than the AAL-2 standard could inspire in its own right, especially given all the latter's further advantages. Applicant also fails to see how it would have been obvious that in their contemporaneous form, either of Lyons or Nagami could incorporate PPP without significant skill and inventiveness being applied to ensure proper and worthwhile operation.

In view of the foregoing, the rejection of claims 12 to 16, 20 to 37, 39, 41 to 48, 52 to 69, 71 to 75, 78 to 82, 84, 86 to 88, 91 to 95, 97 & 99 under 35 U.S.C. §103(a) as being un-patentable over Lyons in view of Nagami cannot be sustained.

Referring to issue 2, the rejection of claims 40, 85, & 98 under 35 U.S.C. §103(a) as being un-patentable over Lyons in view of Nagami and further in view of Lin is moot.

Conclusion

The Examiner has been demonstrated to be in error in rejecting the claims, and reversal is therefore urged.

Respectfully submitted,

Date: August 23, 2004

William M. Lee

William M. Lee, Jr.
Registration No. 26,935

Barnes & Thornburg LLP
PO Box 2786
Chicago IL 60690-2786
(312) 357-1313 Telephone
(312) 759-5646 Facsimile
(312) 214-4811 Direct

APPENDIX

1. - 11. (cancelled)

12. A method of transporting multi-protocol datagrams over a point to point protocol (PPP) link through an asynchronous transport network, comprising the steps of:

encapsulating multi-protocol datagrams into payloads of asynchronous transport network mini-cells, each mini-cell having a header in addition to a payload, the header including a channel identifier (CID) field;

for each mini-cell, associating a PPP identifier of the datagram being encapsulated therein with the CID field of the mini-cell;

assembling said mini-cells into transport packets; and

transporting said packets over said point to point link through the asynchronous transport network.

13. A method as claimed in claim 12, wherein said PPP identifier identifies a PPP session.

14. A method as claimed in claim 12, wherein said PPP identifier identifies at least one PPP protocol within a PPP session.

15. A method as claimed in claim 12, wherein the PPP identifier identifies at least one session within a protocol of a PPP session.

16. A method as claimed in claim 12, wherein the step of associating a PPP identifier with the CID field of a mini-cell comprises inserting a PPP identifier into the CID field of the mini-cell.

17. A method as claimed in claim 16, wherein the PPP identifier of a multi-protocol datagram comprises two octets, a most significant octet and a least

significant octet, and the method includes the step of inserting only the least significant octet of the PPP identifier into the CID field of a mini-cell.

18. A method as claimed in claim 17, wherein it includes the step of inserting the most significant octet of the PPP identifier in a first byte of the mini-cell payload adjacent the header and to indicating the presence of said most significant octet in said first byte of the mini-cell payload by making a value of a least significant bit (LSB) of the least significant octet to be “1”.

19. A method as claimed in claim 18, wherein a LSB of the most significant octet of the PPP identifier is utilised as a bit parity check for error detection.

20. A method as claimed in claim 12, wherein the step of associating a PPP identifier with the CID field of a mini-cell comprises assigning a pre-allocated PPP identifier number to a respective mini-cell CID value and inserting the CID value into the CID field of the mini-cell.

21. A method as claimed in claim 20, wherein the step of assigning a pre-allocated PPP identifier number to a CID value and inserting said CID value into the CID field of a mini-cell includes obtaining the CID value corresponding to a pre-allocated PPP identifier number from a pre-configured table containing a list of pre-allocated PPP identifiers numbers and corresponding CID values.

22. A method as claimed in claim 20, wherein the step of assigning a pre-allocated PPP identifier number to a CID value and inserting said CID value in the CID field of a mini-cell comprises assigning said pre-allocated PPP identifier number to said CID value on set-up of a PPP link, said assignment being carried out by a management function.

23. A method as claimed in claim 12, wherein the asynchronous transport network is an asynchronous transport mode (ATM) network and the mini-cells are ATM adaptation layer 2 (AAL2) mini-cells.

24. A method as claimed in claim 23, wherein it includes the step of mapping a PPP session to a single AAL2 channel.

25. A method as claimed in claim 23, wherein it includes the step of mapping at least one protocol of a PPP session to an AAL2 channel.

26. A method as claimed in claim 23, wherein it includes the step of mapping at least one session of a specified PPP protocol to an AAL2 channel.

27. A method as claimed in claim 23, wherein it includes the step of mapping several PPP sessions to a same AAL2 channel.

28. A method as claimed in claim 23, wherein it includes the step of mapping several protocols from different PPP sessions to a same AAL2 channel.

29. A method as claimed in claim 28, wherein the several protocols from different PPP sessions comprise the same protocol from each of the different PPP sessions.

30. A method as claimed in claim 23, wherein it includes the step of mapping at least one session of a specified PPP protocol of several PPP sessions to a same AAL2 channel.

31. A method as claimed in claim 23 wherein it includes a mapping step, said mapping step comprising a combination of any of:

mapping a PPP session to a single AAL2 channel;

mapping at least one protocol of a PPP session to an AAL2 channel;

mapping at least one session of a specified PPP protocol to an AAL2 channel;

mapping several PPP sessions to a same AAL2 channel;

mapping several protocols from different PPP sessions to a same AAL2 channel; and

mapping at least one session of a specified PPP protocol of several PPP sessions to a same AAL2 channel;

wherein said AAL2 channels comprise an ATM virtual circuit connection (VCC).

32. A method as claimed in any one of claims 23 to 31, wherein it includes the step of scheduling transport of ATM mini-cells of said AAL2 channels according to the type of PPP datagrams encapsulated in the mini-cells being transported in respective AAL2 channels.

33. A method as claimed in claim 23 wherein it includes a mapping step, said mapping step comprising one of:

mapping a PPP session to a single ATM virtual channel connection (VCC);

mapping at least one protocol of a PPP session to an ATM VCC;

mapping at least one session of a specified PPP protocol to an ATM VCC

mapping several PPP sessions to a same ATM VCC;

mapping several protocols from different PPP sessions to a same ATM VCC; and

mapping at least one session of a specified PPP protocol of several PPP sessions to a same ATM VCC.

34. A method as claimed 23, wherein it includes the step of multiplexing mini-cells into an ATM virtual channel connection (VCC).

35. A method as claimed in claim 34, wherein said step of multiplexing mini-cells into an ATM virtual channel connection (VCC) includes multiplexing mini-cells encapsulating PPP datagrams and mini-cells encapsulating non-PPP datagrams into the ATM VCC.

36. A method as claimed in claim 35, wherein said PPP traffic data comprises voice traffic data.

37. A method as claimed in claim 23, wherein the multi-protocol datagrams are encapsulated into mini-cells of variable lengths.

38. A method as claimed in claim 23, wherein multi-protocol datagrams comprising delay sensitive traffic are encapsulated into mini-cells comprising a first channel of an ATM virtual circuit (VC) and datagrams comprising delay insensitive traffic are encapsulated into mini-cells comprising a second channel of said ATM VC.

39. A method as claimed in claim 23, wherein said step of assembling mini-cells into transport packets comprises assembling mini-cells into ATM packets.

40. A method as claimed in claim 23, wherein said step of assembling mini-cells into transport packets comprises assembling mini-cells directly into MPEG-TS frames.

41. A method as claimed in claim 23, wherein said step of assembling mini-cells into transport packets comprises assembling mini-cells directly into TDMA time slots.

42. A method as claimed in claim 12, wherein it includes the step of encoding a flag in a user to user information (UUI) field of a mini-cell to indicate whether an encapsulated datagram extends into a payload of a next mini-cell.

43. A method as claimed in claim 12, wherein the step of encapsulating a datagram in a mini-cell includes inserting the PPP identifier, a payload of the datagram and an optional trailer into the payload of the mini-cell.

44. A method of encapsulating point to point protocol (PPP) datagrams into payloads of asynchronous transport network mini-cells, each mini-cell having a header in addition to a payload, the header including a channel identifier (CID) field, the method comprising the steps of:

encapsulating the PPP datagrams into the payloads of the asynchronous transport network mini-cells;

for each mini-cell, associating a PPP identifier of the datagram being encapsulated therein with the CID field of the mini-cell; and

assembling said mini-cells into transport packets.

45. A method as claimed in claim 44, wherein said PPP identifier identifies a PPP session.

46. A method as claimed in claim 44, wherein said PPP identifier identifies at least one PPP protocol within a PPP session.

47. A method as claimed in claim 44, wherein the PPP identifier identifies at least one session within a protocol of a PPP session.

48. A method as claimed in claim 44, wherein the step of associating a PPP identifier with the CID field of a mini-cell comprises inserting a PPP identifier into the CID field of the mini-cell.

49. A method as claimed in claim 48, wherein the PPP identifier of a multi-protocol datagram comprises two octets, a most significant octet and a least

significant octet, and the method includes the step of inserting only the least significant octet of the PPP identifier into the CID field of a mini-cell.

50. A method as claimed in claim 49, wherein it includes the step of inserting the most significant octet of the PPP identifier in a first byte of the mini-cell payload adjacent the header and to indicating the presence of said most significant octet in said first byte of the mini-cell payload by making a value of a least significant bit (LSB) of the least significant octet to be “1”.

51. A method as claimed in claim 50, wherein a LSB of the most significant octet of the PPP identifier is utilised as a bit parity check for error detection.

52. A method as claimed in claim 44, wherein the step of associating a PPP identifier with the CID field of a mini-cell comprises assigning a pre-allocated PPP identifier number to a respective mini-cell CID value and inserting the CID value into the CID field of the mini-cell.

53. A method as claimed in claim 52, wherein the step of assigning a pre-allocated PPP identifier number to a CID value and inserting said CID value into the CID field of a mini-cell includes obtaining the CID value corresponding to a pre-allocated PPP identifier number from a pre-configured table containing a list of pre-allocated PPP identifiers numbers and corresponding CID values.

54. A method as claimed in claim 52, wherein the step of assigning a pre-allocated PPP identifier number to a CID value and inserting said CID value in the CID field of a mini-cell comprises assigning said pre-allocated PPP identifier number to said CID value on set-up of a PPP link, said assignment being carried out by a management function.

55. A method as claimed in claim 44, wherein the asynchronous transport network is an asynchronous transport mode (ATM) network and the mini-cells are ATM adaptation layer 2 (AAL2) mini-cells.

56. A method as claimed in claim 55, wherein it includes the step of mapping a PPP session to a single AAL2 channel.

57. A method as claimed in claim 55, wherein it includes the step of mapping at least one protocol of a PPP session to an AAL2 channel.

58. A method as claimed in claim 55, wherein it includes the step of mapping at least one session of a specified PPP protocol to an AAL2 channel.

59. A method as claimed in claim 55, wherein it includes the step of mapping several PPP sessions to a same AAL2 channel.

60. A method as claimed in claim 55, wherein it includes the step of mapping several protocols from different PPP sessions to a same AAL2 channel.

61. A method as claimed in claim 60, wherein the several protocols from different PPP sessions comprise the same protocol from each of the different PPP sessions.

62. A method as claimed in claim 55, wherein it includes the step of mapping at least one session of a specified PPP protocol of several PPP sessions to a same AAL2 channel.

63. A method as claimed in claim 55 wherein it includes a mapping step, said mapping step comprising a combination of any of:

mapping a PPP session to a single AAL2 channel;

mapping at least one protocol of a PPP session to an AAL2 channel;

mapping at least one session of a specified PPP protocol to an AAL2 channel;

mapping several PPP sessions to a same AAL2 channel;

mapping several protocols from different PPP sessions to a same AAL2 channel; and

mapping at least one session of a specified PPP protocol of several PPP sessions to a same AAL2 channel;

wherein said AAL2 channels comprise an ATM virtual circuit connection (VCC).

64. A method as claimed in any one of claims 55 to 63, wherein it includes the step of scheduling transport of ATM mini-cells of said AAL2 channels according to the type of PPP datagrams encapsulated in the mini-cells being transported in respective AAL2 channels.

65. A method as claimed in claim 55 wherein it includes a mapping step, said mapping step comprising one of:

mapping a PPP session to a single ATM virtual channel connection (VCC);

mapping at least one protocol of a PPP session to an ATM VCC;

mapping at least one session of a specified PPP protocol to an ATM VCC

mapping several PPP sessions to a same ATM VCC;

mapping several protocols from different PPP sessions to a same ATM VCC; and

mapping at least one session of a specified PPP protocol of several PPP sessions to a same ATM VCC.

66. A method as claimed 55, wherein it includes the step of multiplexing mini-cells into an ATM virtual channel connection (VCC).

67. A method as claimed in claim 66, wherein said step of_multiplexing mini-cells into an ATM virtual channel connection (VCC) includes multiplexing mini-cells encapsulating PPP datagrams and mini-cells encapsulating non-PPP datagrams into the ATM VCC.

68. A method as claimed in claim 67, wherein said PPP traffic data comprises voice traffic data.

69. A method as claimed in claim 55, wherein the multi-protocol datagrams are encapsulated into mini-cells of variable lengths.

70. A method as claimed in claim 55, wherein multi-protocol datagrams comprising delay sensitive traffic are encapsulated into mini-cells comprising a first channel of an ATM virtual circuit (VC) and datagrams comprising delay insensitive traffic are encapsulated into mini-cells comprising a second channel of said ATM VC.

71. A method as claimed in claim 55, wherein said step of assembling mini-cells into transport packets comprises assembling mini-cells into ATM packets.

72. A method as claimed in claim 44, wherein it includes the step of encoding a flag in a user to user information (UUI) field of a mini-cell to indicate whether an encapsulated datagram extends into a payload of a next mini-cell.

73. A method as claimed in claim 44, wherein the step of encapsulating a datagram in a mini-cell includes inserting the PPP identifier, a payload of the datagram and an optional trailer into the payload of the mini-cell.

74. Apparatus for transporting multi-protocol datagrams over a point to point protocol (PPP) link through an asynchronous transport network, comprising:

means for encapsulating multi-protocol datagrams into payloads of asynchronous transport network mini-cells, each mini-cell having a header in addition to a payload, the header including a channel identifier (CID) field;

means for associating a PPP identifier of a datagram being encapsulated into a mini-cell with the CID field of the mini-cell;

means for assembling said mini-cells into transport packets; and

means transporting said packets over said point to point link through the asynchronous transport network.

75. A transport apparatus as claimed in claim 74, wherein said means for associating a PPP identifier with the CID field of a mini-cell is arranged to insert a PPP identifier into the CID field of the mini-cell.

76. A transport apparatus as claimed in claim 75, wherein the means for associating a PPP identifier with the CID field of a mini-cell is arranged to insert only a least significant octet of a two octet PPP identifier into the CID field of a mini-cell.

77. A transport apparatus as claimed in claim 76, wherein the means for associating a PPP identifier with the CID field of a mini-cell is arranged to insert a most significant octet of the PPP identifier in a first byte of the mini-cell payload adjacent the header and to indicating the presence of said most significant octet in said first byte of the mini-cell payload by making a value of a least significant bit (LSB) of the least significant octet to be "1".

78. A transport apparatus as claimed in claim 74, wherein the means for associating a PPP identifier with the CID field of a mini-cell is arranged to assign a pre-allocated PPP identifier number to a respective mini-cell CID value and to insert the CID value into the CID field of the mini-cell.

79. A transport apparatus as claimed in claim 74, wherein the asynchronous transport network is an asynchronous transport mode (ATM) network and the mini-cells are ATM adaptation layer 2 (AAL2) mini-cells.

80. A transport apparatus as claimed in claim 79, wherein it includes means for scheduling transport of ATM mini-cells of said AAL2 channels according to the type of PPP datagrams encapsulated in the mini-cells being transported in respective AAL2 channels.

81. A transport apparatus as claimed 79, wherein it includes means for multiplexing mini-cells into an ATM virtual channel connection (VCC).

82. A transport apparatus as claimed in claim 81, wherein said means for multiplexing mini-cells into an ATM virtual channel connection (VCC) is arranged to multiplex mini-cells encapsulating PPP datagrams and mini-cells encapsulating non-PPP datagrams into the ATM VCC.

83. A transport apparatus as claimed in claim 79, wherein the means for encapsulating datagrams into mini-cells is arranged to encapsulate datagrams comprising delay sensitive traffic into mini-cells comprising a first channel of an ATM virtual circuit (VC) and encapsulate datagrams comprising delay insensitive traffic into mini-cells comprising a second channel of said ATM VC.

84. A transport apparatus as claimed in claim 79, wherein said means for assembling mini-cells into transport packets is arranged to assemble mini-cells into ATM packets.

85. A transport apparatus as claimed in claim 79, wherein said means for assembling mini-cells into transport packets is arranged to assemble mini-cells directly into MPEG-TS frames.

86. A transport apparatus as claimed in claim 79, wherein said means for assembling mini-cells into transport packets is arranged to assemble mini-cells directly into TDMA time slots.

87. Apparatus for encapsulating point to point protocol (PPP) datagrams into payloads of asynchronous transport network mini-cells, each mini-cell having a header in addition to a payload, the header including a channel identifier (CID) field, the apparatus comprising:

means for encapsulating the PPP datagrams into the payloads of the asynchronous transport network mini-cells

means for associating a PPP identifier of a datagram being encapsulated into a mini-cell with the CID field of the mini-cell; and

means for assembling said mini-cells into transport packets.

88. An apparatus as claimed in claim 87, wherein said means for associating a PPP identifier with the CID field of a mini-cell is arranged to insert a PPP identifier into the CID field of the mini-cell.

89. An apparatus as claimed in claim 87, wherein the means for associating a PPP identifier with the CID field of a mini-cell is arranged to insert only a least significant octet of a two octet PPP identifier into the CID field of a mini-cell.

90. An apparatus as claimed in claim 89, wherein the means for associating a PPP identifier with the CID field of a mini-cell is arranged to insert a most significant octet of the PPP identifier in a first byte of the mini-cell payload adjacent the header and to indicating the presence of said most significant octet in said first byte of the mini-cell payload by making a value of a least significant bit (LSB) of the least significant octet to be “1”.

91. An apparatus as claimed in claim 87, wherein the means for associating a PPP identifier with the CID field of a mini-cell is arranged to assign a pre-

allocated PPP identifier number to a respective mini-cell CID value and to insert the CID value into the CID field of the mini-cell.

92. An apparatus as claimed in claim 87, wherein the asynchronous transport network is an asynchronous transport mode (ATM) network and the mini-cells are ATM adaptation layer 2 (AAL2) mini-cells.

93. An apparatus as claimed in claim 92, wherein it includes means for scheduling transport of ATM mini-cells of said AAL2 channels according to the type of PPP datagrams encapsulated in the mini-cells being transported in respective AAL2 channels.

94. An apparatus as claimed 92, wherein it includes means for multiplexing mini-cells into an ATM virtual channel connection (VCC).

95. An apparatus as claimed in claim 94, wherein said means for multiplexing mini-cells into an ATM virtual channel connection (VCC) is arranged to multiplex mini-cells encapsulating PPP datagrams and mini-cells encapsulating non-PPP datagrams into the ATM VCC.

96. An apparatus as claimed in claim 92, wherein the means for encapsulating datagrams into mini-cells is arranged to encapsulate datagrams comprising delay sensitive traffic into mini-cells comprising a first channel of an ATM virtual circuit (VC) and encapsulate datagrams comprising delay insensitive traffic into mini-cells comprising a second channel of said ATM VC.

97. An apparatus as claimed in claim 92, wherein said means for assembling mini-cells into transport packets is arranged to assemble mini-cells into ATM packets.

98. An apparatus as claimed in claim 92, wherein said means for assembling mini-cells into transport packets is arranged to assemble mini-cells directly into MPEG-TS frames.

99. An apparatus as claimed in claim 92, wherein said means for assembling mini-cells into transport packets is arranged to assemble mini-cells directly into TDMA time slots.